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(54) **SYSTEMS AND METHODS FOR AUTOMATIC SPELL CHECKING OF DYNAMICALLY GENERATED WEB PAGES**

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(52) **U.S. Cl.** ..... **715/257; 715/752; 709/203; 709/223**

(58) **Field of Classification Search** ..... **715/257, 715/234-237**

See application file for complete search history.

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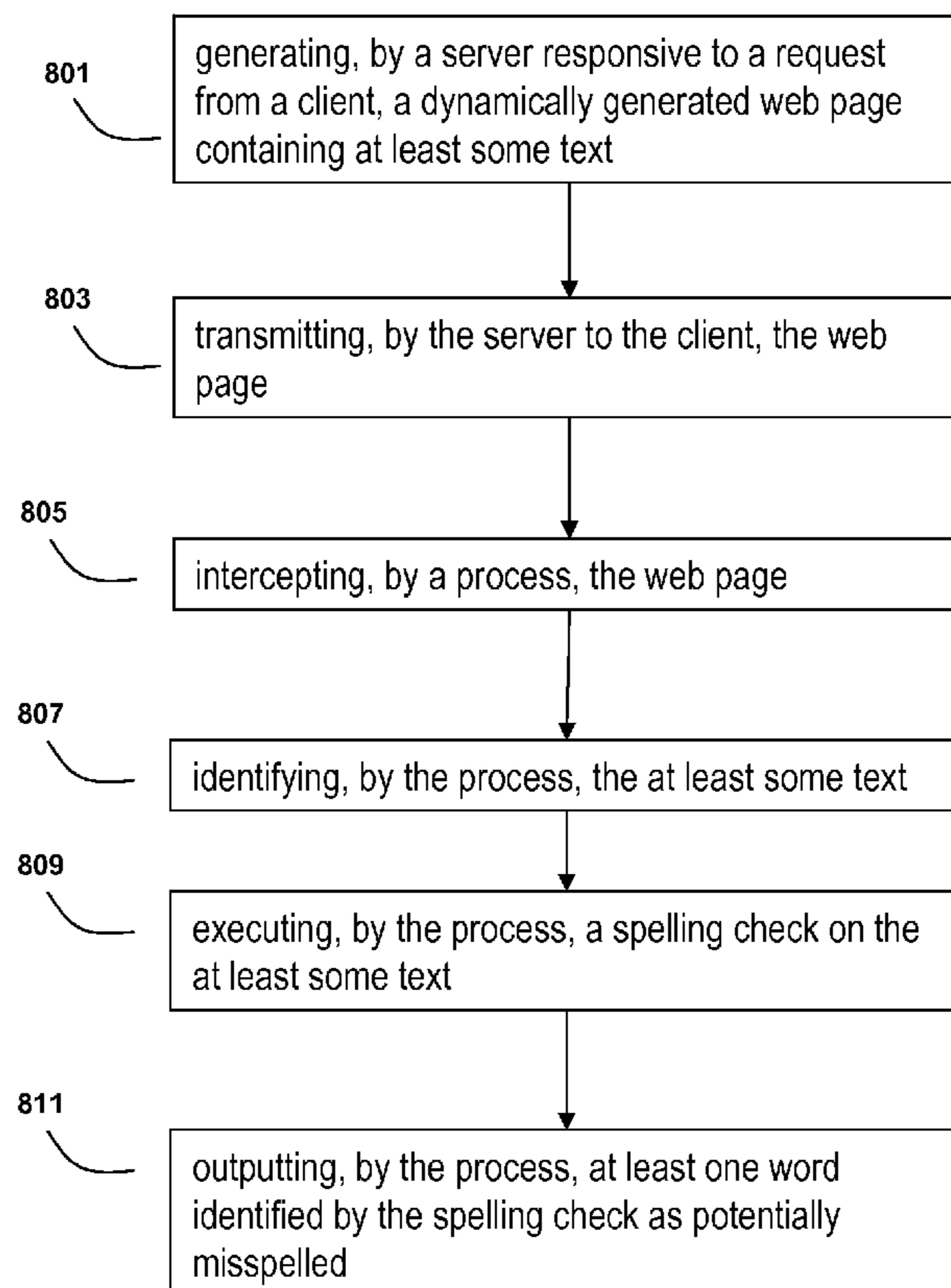
*Primary Examiner* — Quoc A Tran

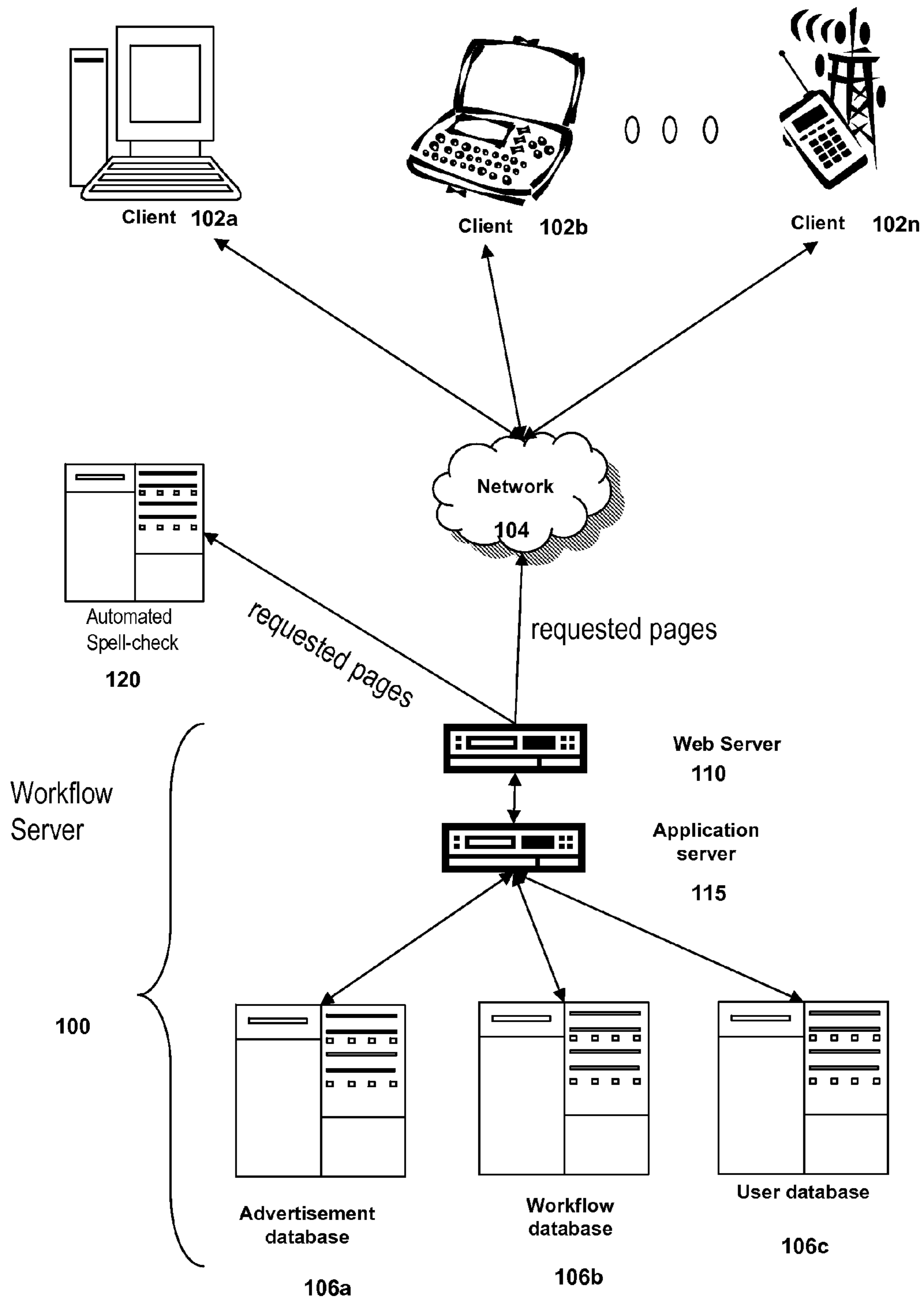
(74) *Attorney, Agent, or Firm* — Foley & Lardner LLP; John D. Lanza

(57) **ABSTRACT**

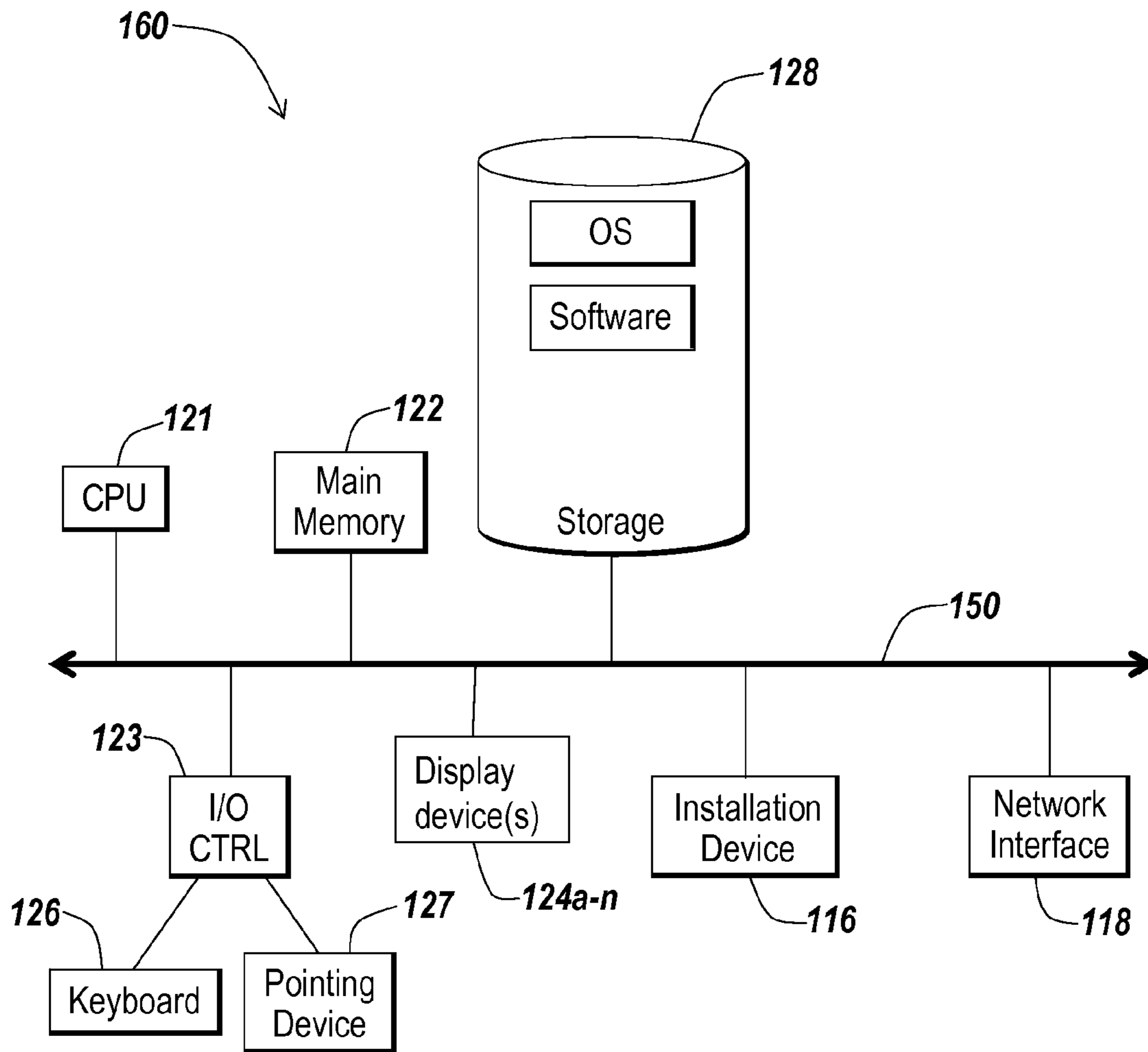
Systems and methods for automatically spell-checking dynamically generated web pages include: generating, by a server responsive to a request from a client, a dynamically generated web page containing at least some text; transmitting, by the server to the client, the dynamic web page; intercepting, by a process, the dynamic web page; identifying, by the process, the at least some text; executing, by the process, a spelling check on the at least some text; and outputting, by the process, at least one word identified by the spelling check as potentially misspelled.

**13 Claims, 11 Drawing Sheets**

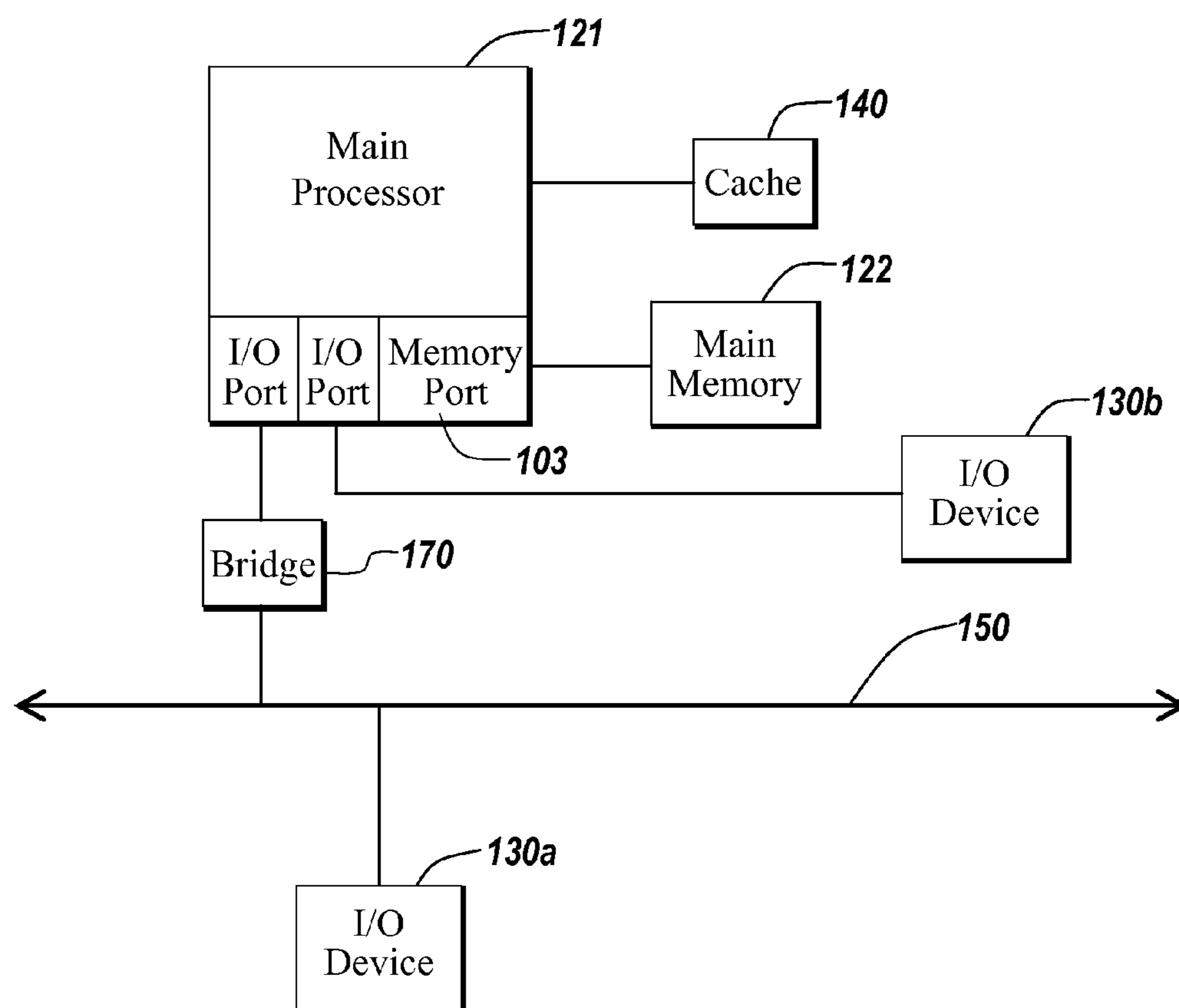




*Fig. 1A*



*Fig. 1B*



*Fig. 1C*

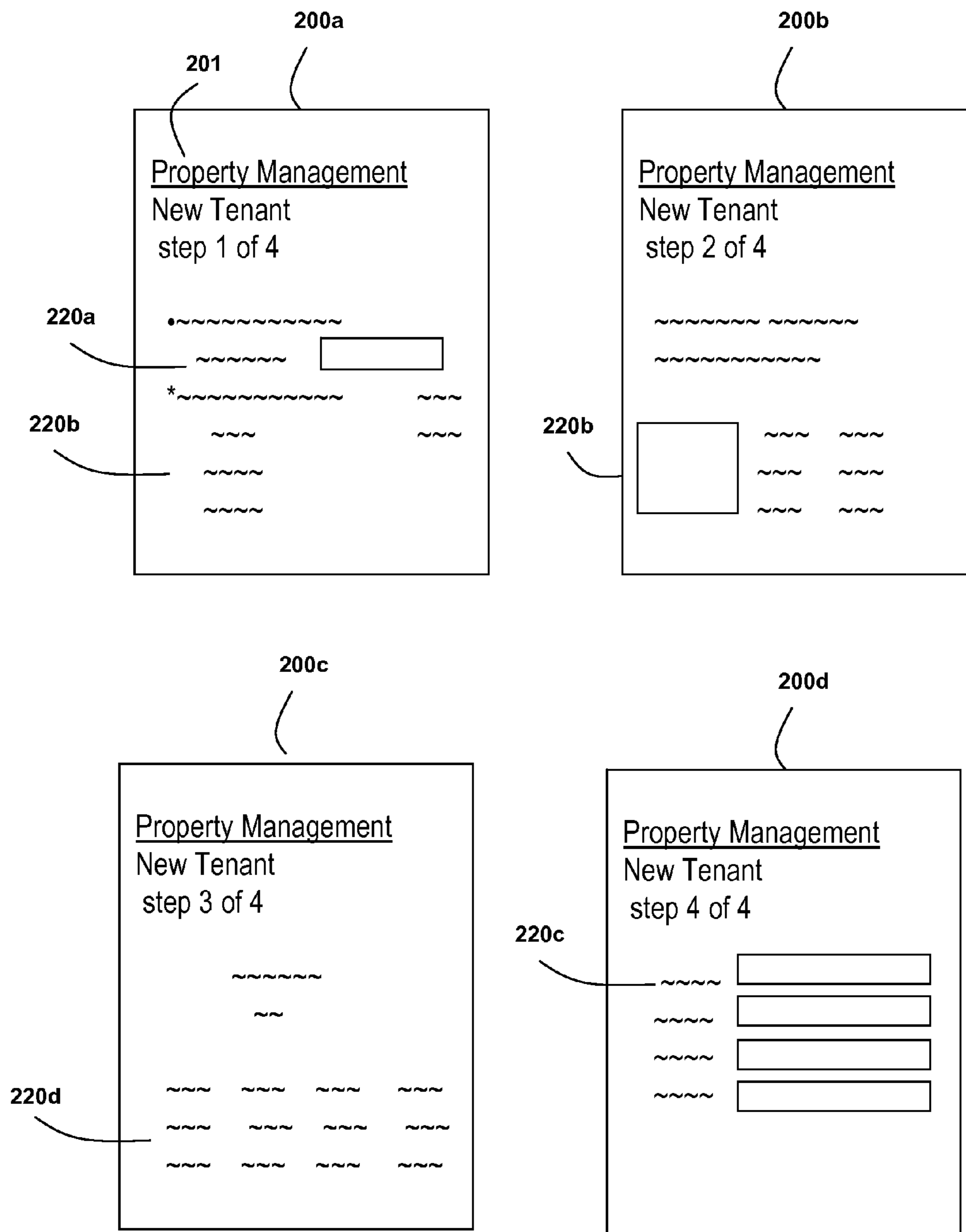
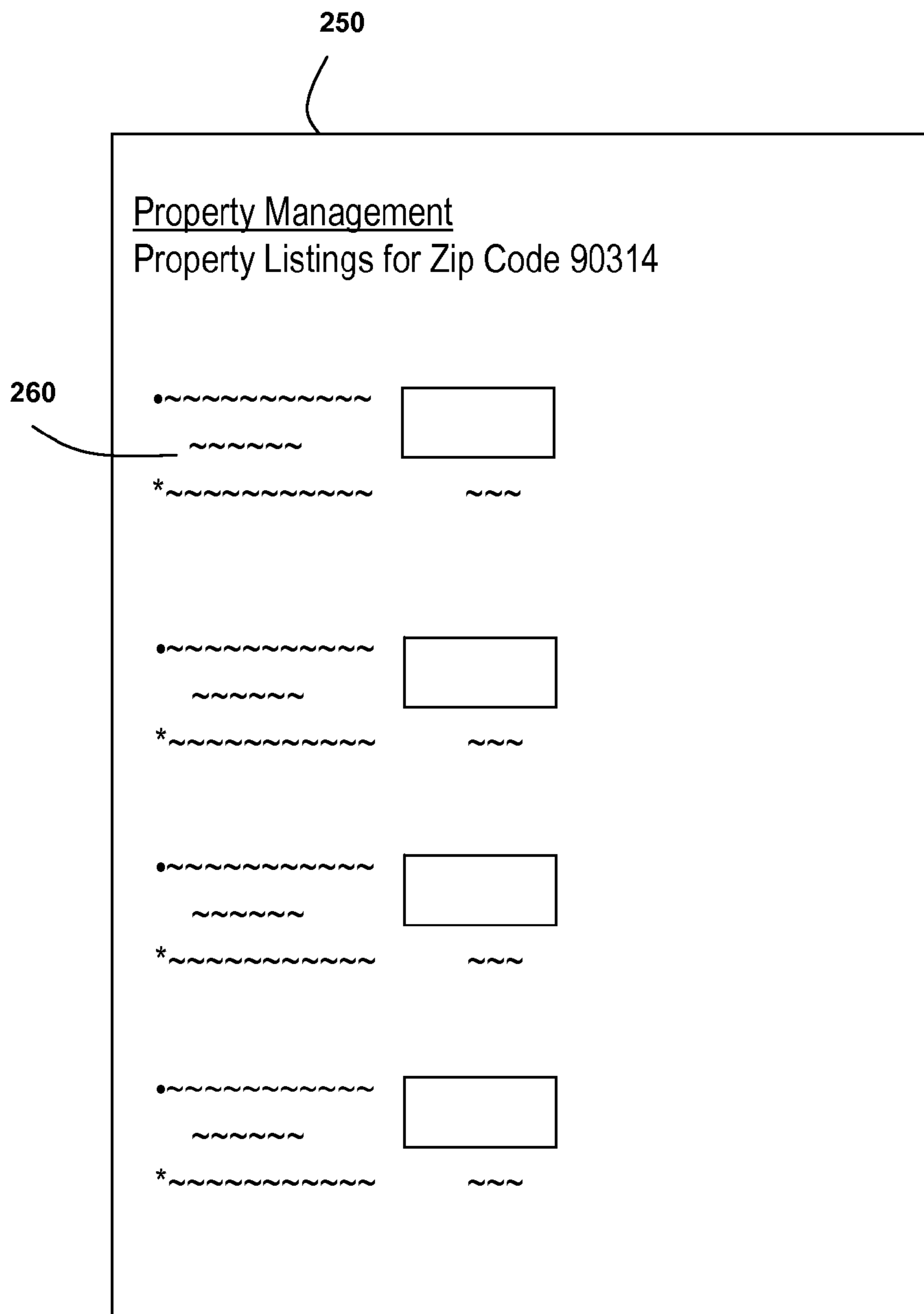


Fig. 2A



*Fig. 2B*

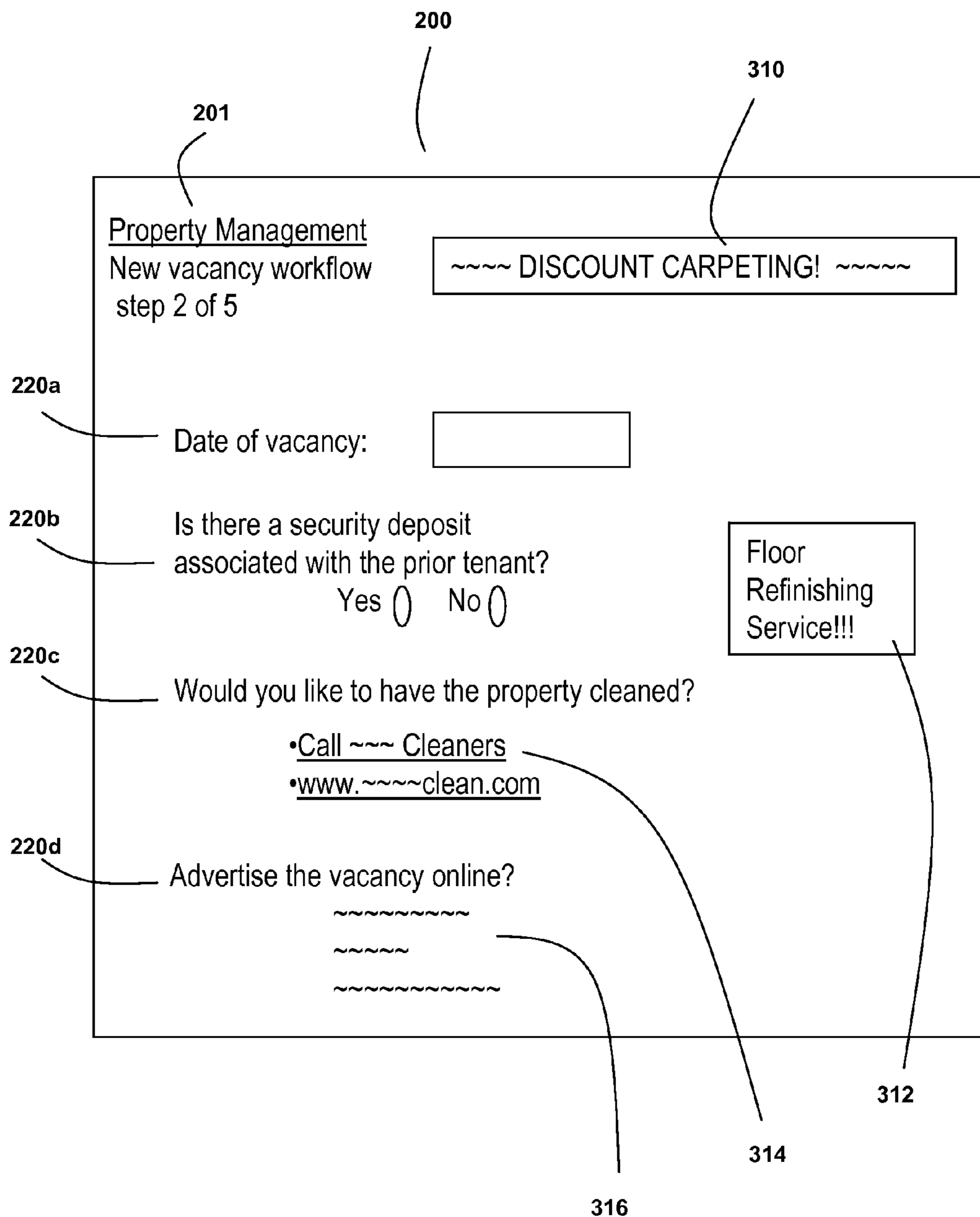
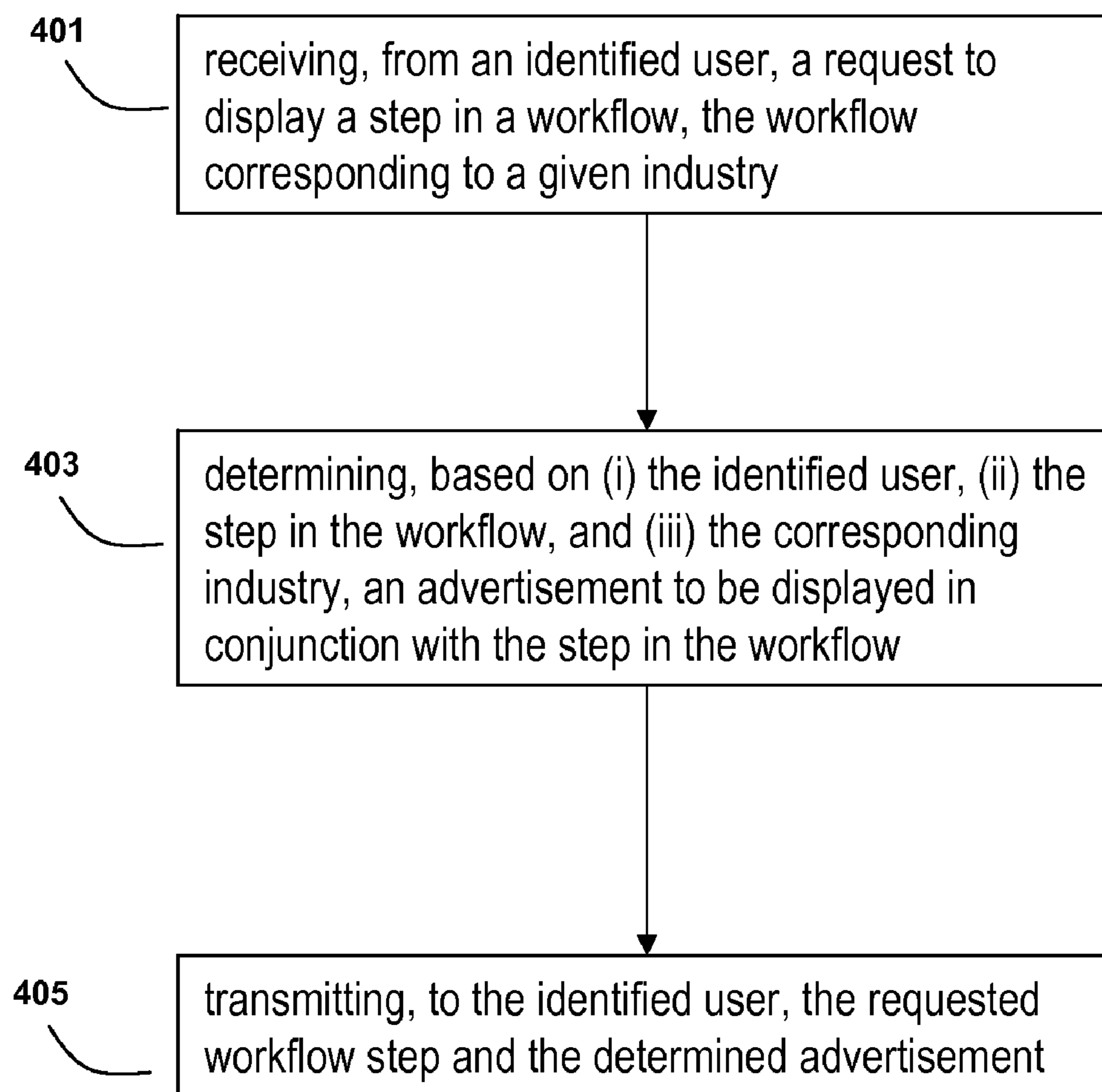


Fig. 3



*Fig. 4*



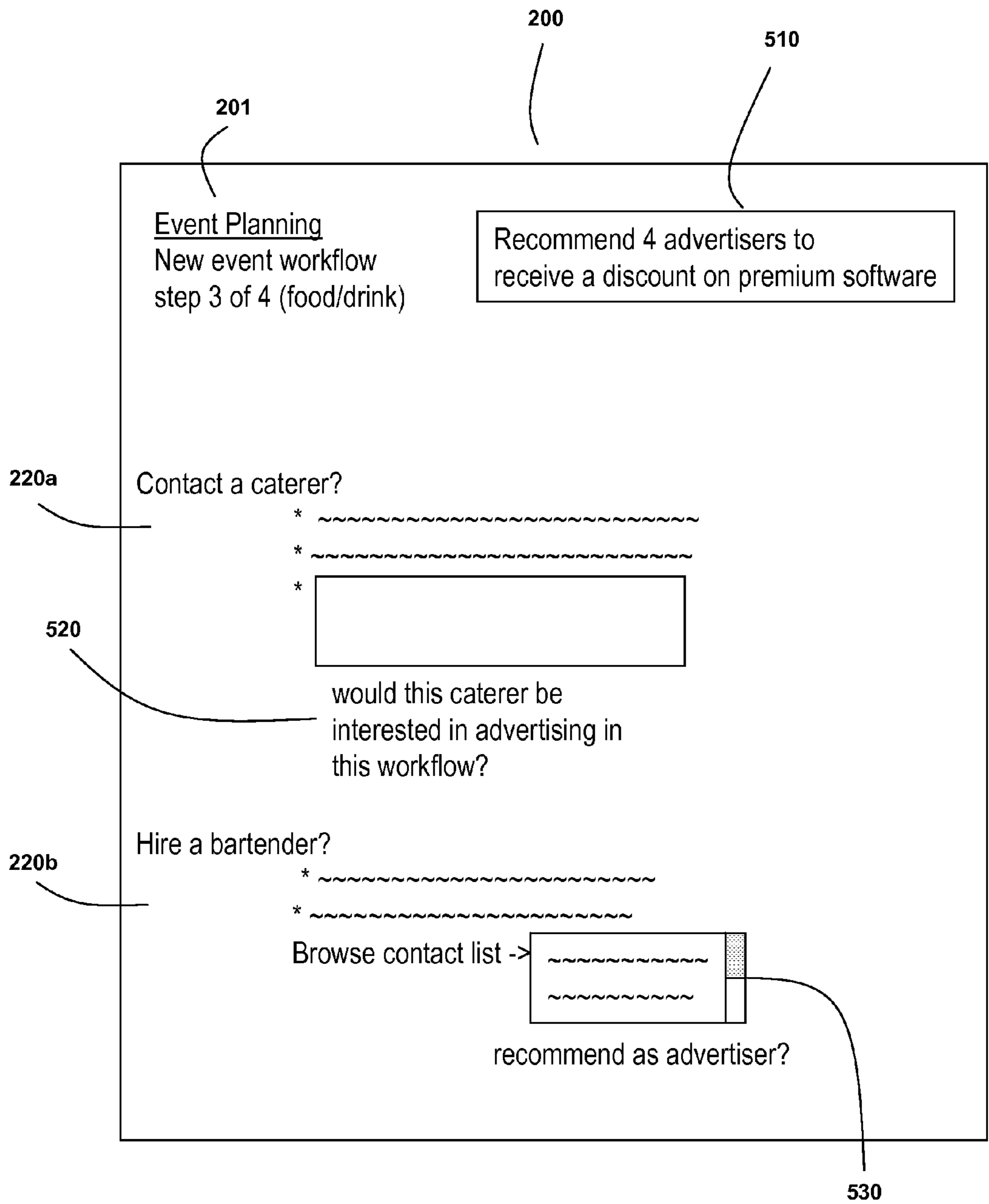
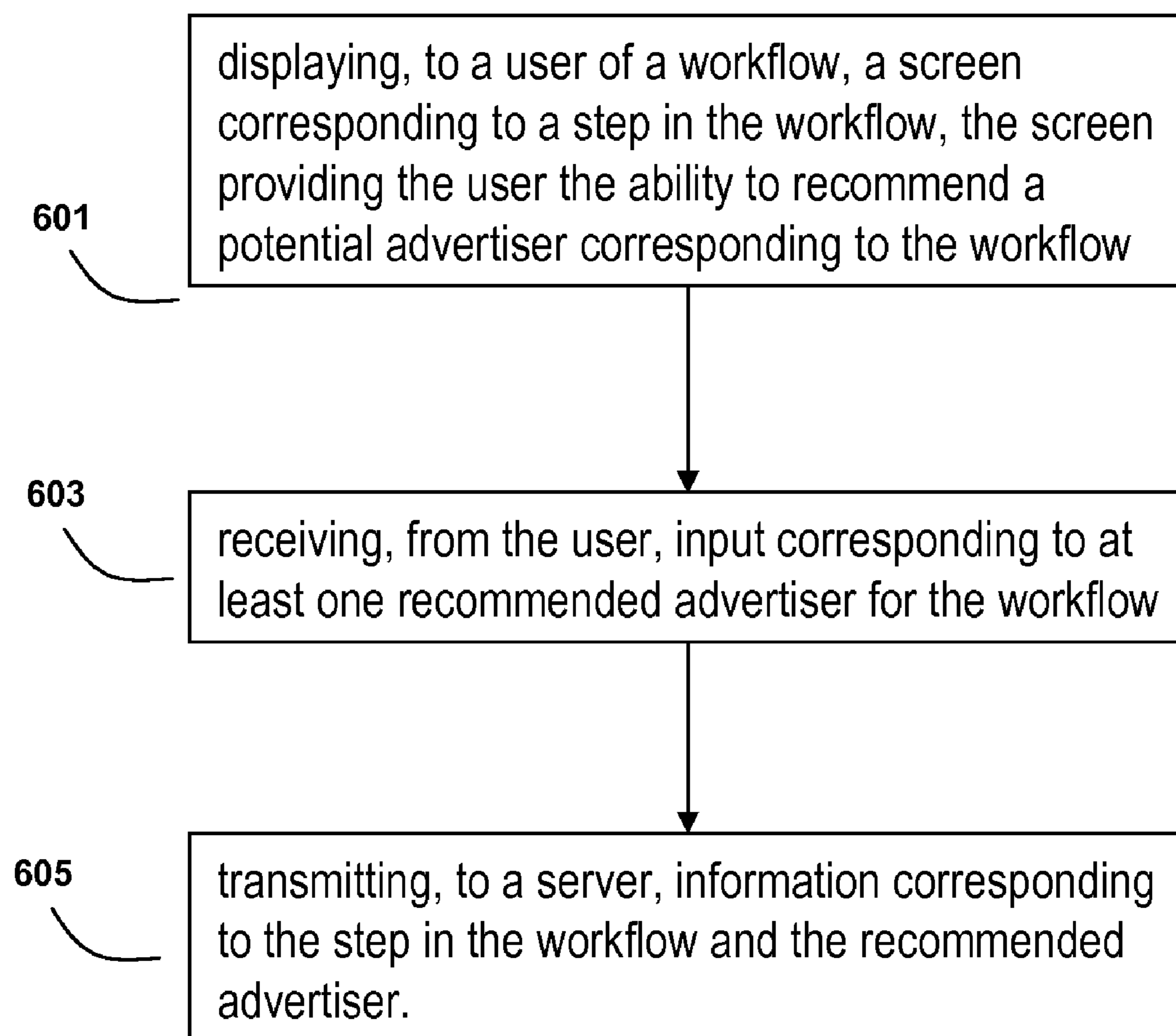
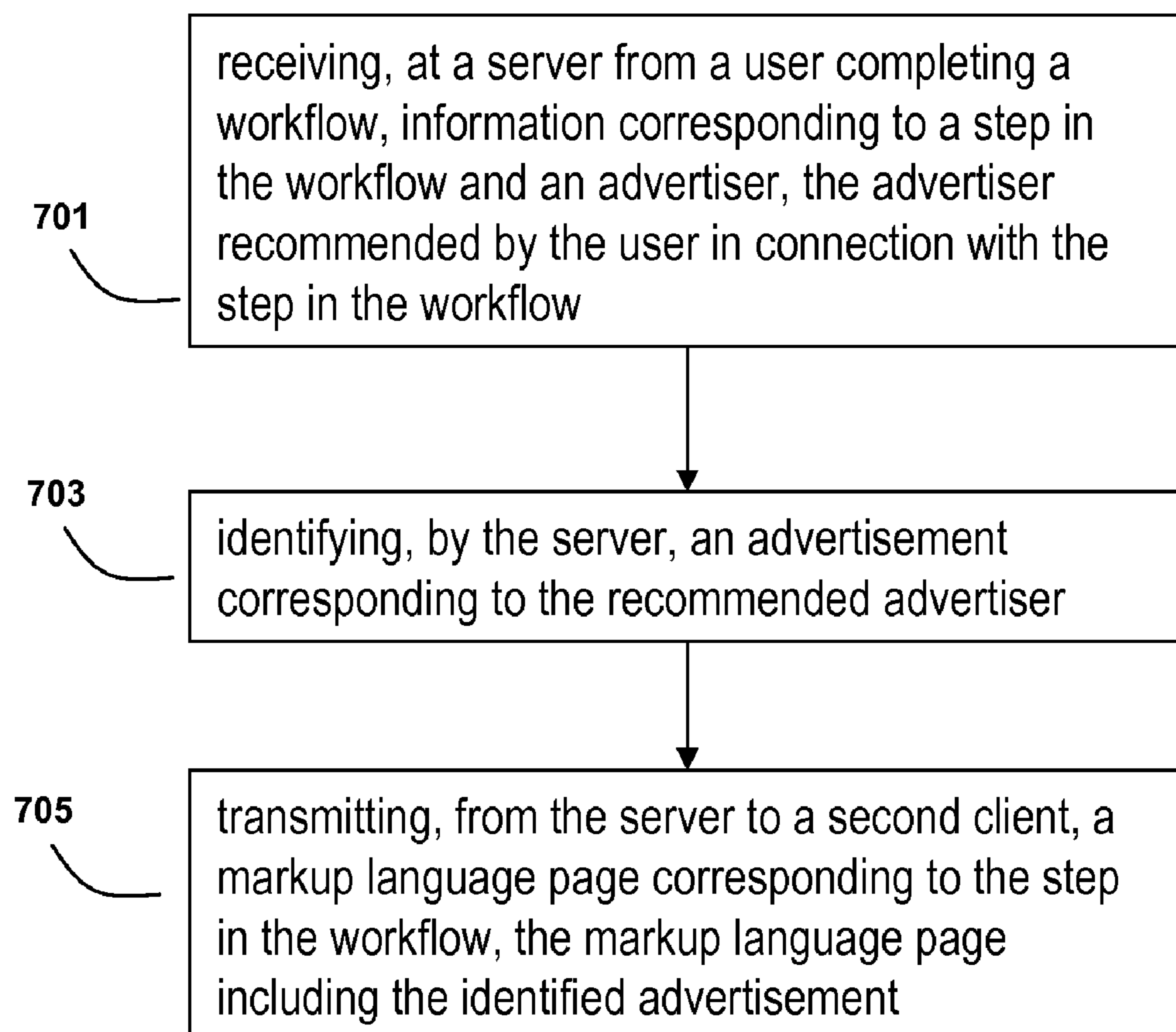


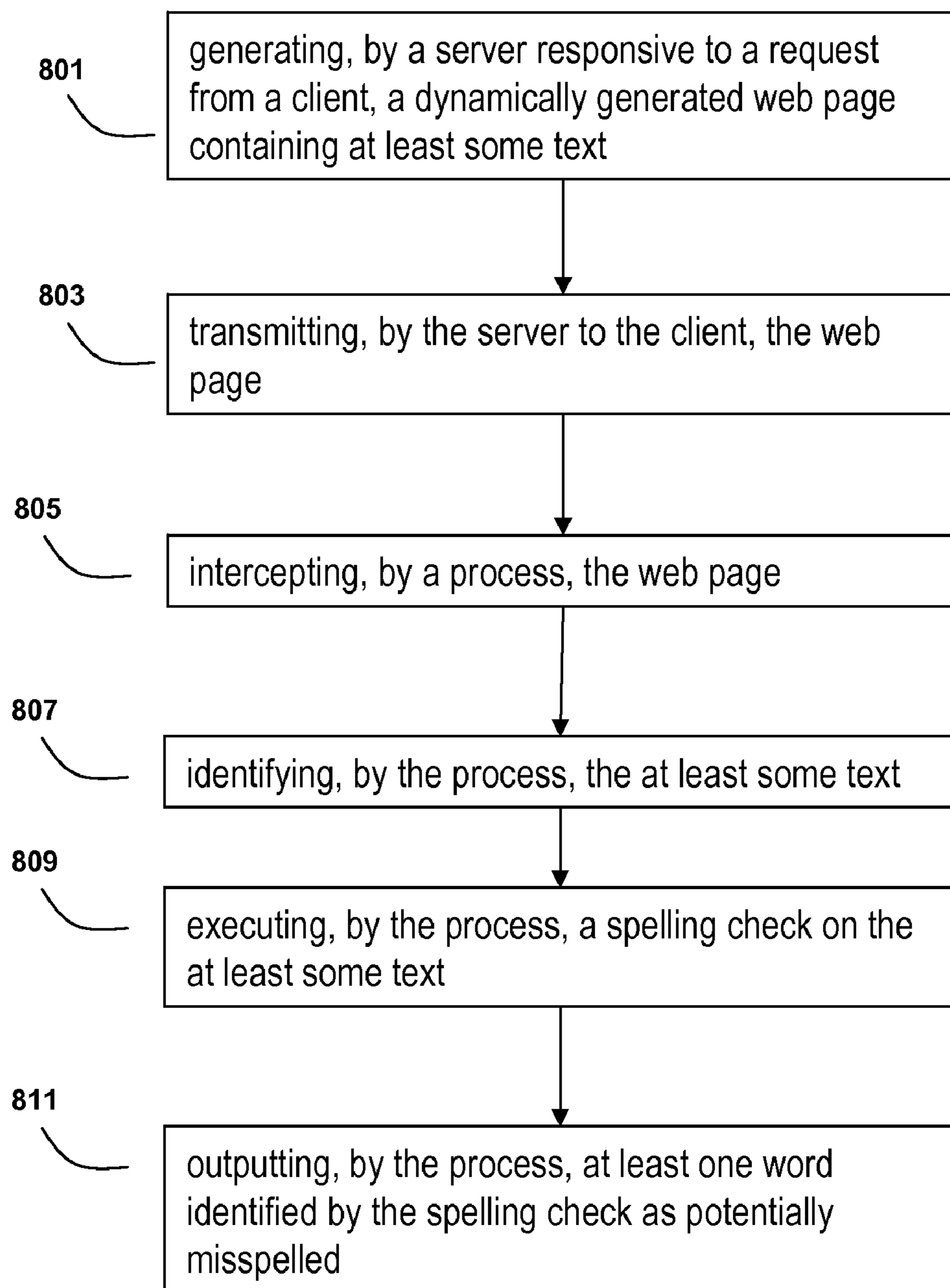
Fig. 5



*Fig. 6*



*Fig. 7*

*Fig. 8*



1

# SYSTEMS AND METHODS FOR AUTOMATIC SPELL CHECKING OF DYNAMICALLY GENERATED WEB PAGES

## FIELD OF THE INVENTION

The present invention relates to computer software and network applications, and, more specifically, means of automatic spell checking for dynamically generated web pages.

## BACKGROUND OF THE INVENTION

Workflow software and services are common in many industries. Workflow software may be used to accomplish or aid in several occupational or industry specific tasks. Workflow software may include any software that performs or aids in accomplishing a discrete job-related task. Examples of workflow software may include inventory management software, personnel tracking software, accounting software, enterprise resource planning (ERP) software and trip or event planning software. Workflow software often is customized for a given industry or occupation to provide optimal functionality. For example, a workflow designed for a health care provider may have built-in functions for handling health insurance payments, or complying with government regulations.

Workflow software may be provided on a hosted basis, where the workflows and associated data are hosted by a third party and accessed through one or more web sites. The web pages containing the workflows and associated reports are often dynamically generated. Because of the large data sets which the web pages may draw from, and the number of pages in a workflow site, manually checking the accuracy of each page may be prohibitive. Thus there exists a need to automatically spell-check dynamically generated workflow pages.

## BRIEF SUMMARY OF THE INVENTION

In one aspect, the present invention is a method for automatically spell-checking dynamically generated web pages. In one embodiment, the method includes: generating, by a server responsive to a request from a client, a dynamically generated web page containing at least some text; transmitting, by the server to the client, the dynamic web page; intercepting, by a process, the dynamic web page; identifying, by the process, the at least some text; executing, by the process, a spelling check on the at least some text; and outputting, by the process, at least one word identified by the spelling check as potentially misspelled.

In another aspect, the present invention is a computer-implemented system for automatically spell-checking dynamically generated web pages. In one embodiment, the system includes: a server which generates, responsive to a request from a client, a dynamically generated web page containing at least some text; and transmits, to the client, the dynamic web page; means for intercepting the dynamic web page; means for identifying the at least some text; means for executing a spelling check on the at least some text; and means for outputting at least one word identified by the spelling check as potentially misspelled.

## BRIEF DESCRIPTION OF THE DRAWINGS

The foregoing and other objects, aspects, features, and advantages of the invention will become more apparent and

2

better understood by referring to the following description taken in conjunction with the accompanying drawings, in which:

FIG. 1A is a block diagram of one embodiment of a system for deploying workflows to computer users;

FIGS. 1B and 1C are block diagrams of example computing devices;

FIG. 2A is a block diagram of one example of a workflow;

FIG. 2B is a block diagram of one example of a workflow report;

FIG. 3 is a block diagram of an example workflow step with targeted advertising;

FIG. 4 is a method for displaying targeted advertisements to users of workflow software;

FIG. 5 is an example workflow step enabling community recommended advertising;

FIG. 6 is a block diagram of a method for allowing targeted advertisements to be recommended by users of workflow software;

FIG. 7 is a flow diagram of a second method for allowing targeted advertisements to be recommended by users of workflow software and displaying the recommended advertisements to users of the workflow software; and

FIG. 8 is a flow diagram of a method for automatically spell-checking dynamically generated web pages

## DETAILED DESCRIPTION OF THE INVENTION

Referring now to FIG. 1A, a block diagram of one embodiment of a system for deploying workflows to computer users is shown. In brief overview, a number of clients, **102a**, **102b**, . . . **102n** (generally **102**), are connected via a network **104** to a workflow server **100**. The workflow server **100** may comprise a number of elements including a web server **110**, an application server **115**, and a number of databases including an advertisement database **106a**, a workflow database **106b**, and a user database **106c**. An automated spell-check device **120** may intercept web pages served by the workflow server for purposes of spell-checking the textual contents of those pages.

In some embodiments, some or all of the workflow server elements may occupy the same physical machine, and may share any resources, including processors, memory, and communication links. In other embodiments, a workflow server element may be distributed across multiple scalable, fault-tolerant, redundant machines. In some embodiments, these machines may be geographically distributed across a number of sites.

Still referring to FIG. 1A, now in greater detail, a number of clients **102** are shown. A client may comprise any computing device capable of sending or receiving information. Examples of clients **102** may include personal computers, laptop computers, desktop computers, personal digital assistants, and mobile phones. A client **102** may include a display device, such as a monitor or screen, for displaying a received workflow to a user, and an input device, such as a keyboard or mouse, for accepting input of data corresponding to the workflow.

As shown, the clients **102** are connected to a workflow server **100** via a network **104**. The network **104** may comprise the Internet, local networks, web servers, file servers, routers, load balancers, databases, computers, servers, network appliances, or any other computing devices capable of sending and receiving information. The network **104** may comprise computing devices connected via cables, IR ports, wireless signals, or any other means of connecting multiple computing devices. The network and any devices connected to the net-



works may communicate via any communication protocol used to communicate among or within computing devices, including without limitation SSL, HTML, XML, RDP, ICA, FTP, HTTP, TCP, IP, UDP, IPX, SPX, NetBIOS, NetBEUI, SMB, SMTP, POP, IMAP, Ethernet, ARCNET, Fiber Distributed Data Interface (FDDI), RS232, IEEE 802.11, IEEE 802.11a, IEEE 802.11b, IEEE 802.11g and direct asynchronous connections, or any combination thereof. The network **104** may comprise mobile telephone networks utilizing any protocol or protocols used to communicate among mobile devices, including AMPS, TDMA, CDMA, GSM, GPRS or UMTS. The network may comprise a plurality of physically distinct networks, and the network may comprise a plurality of sub-networks connected in any manner.

A workflow server **100** may comprise any server or servers capable of sending and receiving data. A workflow server **100** may perform any function related to the delivery and processing of workflows, including without limitation serving web pages corresponding to workflow steps, receiving and processing web page input, storing user, advertiser, and workflow information, and contacting and transacting with external resources. In one embodiment, a workflow server **100** may be implemented using an application server model, wherein a web server **110** handles web requests from clients and serves pages, an application server **115** coordinates workflow logic, and a number of databases **106** manage data, including without limitation user data, workflow data, and advertiser data. In another embodiment, a workflow server may be implemented using a distributed, scalable, fault-tolerant, redundant server architecture.

An automated spell check **120** may be executed on any computing device, including without limitation any component or components of a workflow server **100**. In some embodiments, an automated spell check **120** may execute on a network appliance. In other embodiments, an automated spell check **120** may execute on a standalone server. In still other embodiments, an automated spell check **120** may execute on a developer workstation. In some embodiments, the automated spell check **120** may be deployed at the same site as the workflow server **100**. In other embodiments, the automated spell check **120** may be deployed at the same site as a client **102**. In some embodiments, the automated spell check **120** may comprise an application which can be installed on any number of machines. In some embodiments, an automated spell check may be in communication with one or more workstations to report results of a spell check of a web page served by the workflow server **100**. For example, an automated spell check **120** may send a listing of spelling errors to a designated administrative computer associated with a firm that uses the workflow software. An administrator at the firm may then use the spell check data to correct any workflow web pages. Or, for example, an automated spell check **120** may send a listing of spelling errors to an administrator of the workflow server **100**, who then may correct any errors.

A client **102** and server **106** may be deployed as and/or executed on any type and form of computing device, such as a computer, network device or appliance capable of communicating on any type and form of network and performing the operations described herein. FIGS. 1B and 1C depict block diagrams of a computing device **160** useful for practicing an embodiment of the client **102** or a server **106**. As shown in FIGS. 1B and 1C, each computing device **160** includes a central processing unit **121**, and a main memory unit **122**. As shown in FIG. 1B, a computing device **160** may include a visual display device **124**, a keyboard **126** and/or a pointing device **127**, such as a mouse. As shown in FIG. 1C, each

computing device **160** may also include additional optional elements, such as one or more input/output devices **130a-130b** (generally referred to using reference numeral **130**), and a cache memory **140** in communication with the central processing unit **121**.

The central processing unit **121** is any logic circuitry that responds to and processes instructions fetched from the main memory unit **122**. In many embodiments, the central processing unit is provided by a microprocessor unit, such as: those manufactured by Intel Corporation of Mountain View, Calif.; those manufactured by Motorola Corporation of Schaumburg, Ill.; those manufactured by Transmeta Corporation of Santa Clara, Calif.; the RS/6000 processor, those manufactured by International Business Machines of White Plains, N.Y.; or those manufactured by Advanced Micro Devices of Sunnyvale, Calif. The computing device **160** may be based on any of these processors, or any other processor capable of operating as described herein.

Main memory unit **122** may be one or more memory chips capable of storing data and allowing any storage location to be directly accessed by the microprocessor **121**, such as Static random access memory (SRAM), Burst SRAM or Synchronous Burst SRAM (BSRAM), Dynamic random access memory (DRAM), Fast Page Mode DRAM (FPM DRAM), Enhanced DRAM (EDRAM), Extended Data Output RAM (EDO RAM), Extended Data Output DRAM (EDO DRAM), Burst Extended Data Output DRAM (BEDO DRAM), Enhanced DRAM (EDRAM), synchronous DRAM (SDRAM), JEDEC SRAM, PC100 SDRAM, Double Data Rate SDRAM (DDR SDRAM), Enhanced SDRAM (ESDRAM), SyncLink DRAM (SLDRAM), Direct Rambus DRAM (DRDRAM), or Ferroelectric RAM (FRAM). The main memory **122** may be based on any of the above described memory chips, or any other available memory chips capable of operating as described herein. In the embodiment shown in FIG. 1B, the processor **121** communicates with main memory **122** via a system bus **150** (described in more detail below). FIG. 1C depicts an embodiment of a computing device **160** in which the processor communicates directly with main memory **122** via a memory port **103**. For example, in FIG. 1C the main memory **122** may be DRDRAM.

FIG. 1C depicts an embodiment in which the main processor **121** communicates directly with cache memory **140** via a secondary bus, sometimes referred to as a backside bus. In other embodiments, the main processor **121** communicates with cache memory **140** using the system bus **150**. Cache memory **140** typically has a faster response time than main memory **122** and is typically provided by SRAM, BSRAM, or EDRAM. In the embodiment shown in FIG. 1C, the processor **121** communicates with various I/O devices **130** via a local system bus **150**. Various buses may be used to connect the central processing unit **121** to any of the I/O devices **130**, including a VESA VL bus, an ISA bus, an EISA bus, a MicroChannel Architecture (MCA) bus, a PCI bus, a PCI-X bus, a PCI-Express bus, or a NuBus. For embodiments in which the I/O device is a video display **124**, the processor **121** may use an Advanced Graphics Port (AGP) to communicate with the display **124**. FIG. 1C depicts an embodiment of a computer **100** in which the main processor **121** communicates directly with I/O device **130b** via HyperTransport, Rapid I/O, or InfiniBand. FIG. 1C also depicts an embodiment in which local busses and direct communication are mixed: the processor **121** communicates with I/O device **130a** using a local interconnect bus while communicating with I/O device **130b** directly.

The computing device **160** may support any suitable installation device **116**, such as a floppy disk drive for receiving



## 5

floppy disks such as 3.5-inch, 5.25-inch disks or ZIP disks, a CD-ROM drive, a CD-R/RW drive, a DVD-ROM drive, tape drives of various formats, USB device, hard-drive or any other device suitable for installing software and programs or portions thereof. The computing device **160** may further comprise a storage device, such as one or more hard disk drives or redundant arrays of independent disks, Flash memory, or EEPROMs, for storing an operating system and other related software, and for storing application software programs. Optionally, any of the installation devices **116** could also be used as the storage device. Additionally, the operating system and the software can be run from a bootable medium, for example, a bootable CD, such as KNOPPIX®, a bootable CD for GNU/Linux that is available as a GNU/Linux distribution from knoppix.net.

Furthermore, the computing device **160** may include a network interface **118** to interface to a Local Area Network (LAN), Wide Area Network (WAN) or the Internet through a variety of connections including, but not limited to, standard telephone lines, LAN or WAN links (e.g., 802.11, T1, T3, 56 kb, X.25, SNA, DECNET), broadband connections (e.g., ISDN, Frame Relay, ATM, Gigabit Ethernet, Ethernet-over-SONET, ADSL, SDSL), wireless connections, or some combination of any or all of the above. Connections can be established using a variety of communication protocols (e.g., TCP/IP, IPX, SPX, NetBIOS, Ethernet, ARCNET, SONET, SDH, Fiber Distributed Data Interface (FDDI), RS232, IEEE 802.11, IEEE 802.11a, IEEE 802.11b, IEEE 802.11g, CDMA, GSM, WiMax and direct asynchronous connections). In one embodiment, the computing device **160** communicates with other computing devices **160'** via any type and/or form of gateway or tunneling protocol such as Secure Socket Layer (SSL) or Transport Layer Security (TLS), or the Citrix Gateway Protocol manufactured by Citrix Systems, Inc. of Ft. Lauderdale, Fla. The network interface **118** may comprise a built-in network adapter, network interface card, PCMCIA network card, card bus network adapter, wireless network adapter, USB network adapter, modem or any other device suitable for interfacing the computing device **160** to any type of network capable of communication and performing the operations described herein.

A wide variety of I/O devices **130a-130b** may be present in the computing device **160**. Input devices include keyboards, mice, trackpads, trackballs, microphones, and drawing tablets. Output devices include video displays, speakers, inkjet printers, laser printers, and dye-sublimation printers. The I/O devices may be controlled by an I/O controller **123** as shown in FIG. 1B. The I/O controller may control one or more I/O devices such as a keyboard **126** and a pointing device **127**, e.g., a mouse or optical pen. Furthermore, an I/O device may also provide storage and/or an installation medium **116** for the computing device **160**. In still other embodiments, the computing device **160** may provide USB connections to receive handheld USB storage devices such as the USB Flash Drive line of devices manufactured by Twintech Industry, Inc. of Los Alamitos, Calif.

In some embodiments, the computing device **160** may comprise or be connected to multiple display devices **124a-124n**, which each may be of the same or different type and/or form. As such, any of the I/O devices **130a-130n** and/or the I/O controller **123** may comprise any type and/or form of suitable hardware, software, or combination of hardware and software to support, enable or provide for the connection and use of multiple display devices **124a-124n** by the computing device **160**. For example, the computing device **160** may include any type and/or form of video adapter, video card, driver, and/or library to interface, communicate, connect or

## 6

otherwise use the display devices **124a-124n**. In one embodiment, a video adapter may comprise multiple connectors to interface to multiple display devices **124a-124n**. In other embodiments, the computing device **160** may include multiple video adapters, with each video adapter connected to one or more of the display devices **124a-124n**. In some embodiments, any portion of the operating system of the computing device **160** may be configured for using multiple displays **124a-124n**. In other embodiments, one or more of the display devices **124a-124n** may be provided by one or more other computing devices, such as computing devices **100a** and **100b** connected to the computing device **160**, for example, via a network. These embodiments may include any type of software designed and constructed to use another computer's display device as a second display device **124a** for the computing device **160**. One ordinarily skilled in the art will recognize and appreciate the various ways and embodiments that a computing device **160** may be configured to have multiple display devices **124a-124n**.

In further embodiments, an I/O device **130** may be a bridge between the system bus **150** and an external communication bus, such as a USB bus, an Apple Desktop Bus, an RS-232 serial connection, a SCSI bus, a FireWire bus, a FireWire 800 bus, an Ethernet bus, an AppleTalk bus, a Gigabit Ethernet bus, an Asynchronous Transfer Mode bus, a HIPPI bus, a Super HIPPI bus, a SerialPlus bus, a SCI/LAMP bus, a Fibre-Channel bus, or a Serial Attached small computer system interface bus.

A computing device **160** of the sort depicted in FIGS. 1B and 1C typically operates under the control of operating systems, which control scheduling of tasks and access to system resources. The computing device **160** can be running any operating system such as any of the versions of the MICROSOFT WINDOWS operating systems, the different releases of the Unix and Linux operating systems, any version of the MAC OS for Macintosh computers, any embedded operating system, any real-time operating system, any open source operating system, any proprietary operating system, any operating systems for mobile computing devices, or any other operating system capable of running on the computing device and performing the operations described herein. Typical operating systems include: WINDOWS 3.x, WINDOWS 95, WINDOWS 98, WINDOWS 2000, WINDOWS NT 3.51, WINDOWS NT 4.0, WINDOWS CE, WINDOWS XP, and WINDOWS VISTA, all of which are manufactured by Microsoft Corporation of Redmond, Wash.; MACOS, manufactured by Apple Computer of Cupertino, Calif.; OS/2, manufactured by International Business Machines of Armonk, N.Y.; and Linux, an open source operating system distributed by, among others, Red Hat, Inc., or any type and/or form of a Unix operating system, among others.

The computer system **100** can be any workstation, desktop computer, laptop or notebook computer, server, handheld computer, mobile telephone or other portable telecommunication device, media playing device, a gaming system, mobile computing device, or any other type and/or form of computing, telecommunications or media device that is capable of communication and that has sufficient processor power and memory capacity to perform the operations described herein. For example, the computer system **100** may comprise a device of the IPOD family of devices manufactured by Apple Computer of Cupertino, Calif., a PLAYSTATION 2, PLAYSTATION 3, or PERSONAL PLAYSTATION PORTABLE (PSP) device manufactured by the Sony Corporation of Tokyo, Japan, a NINTENDO DS, NINTENDO GAMEBOY, NINTENDO GAMEBOY ADVANCED or NINTENDO REVOLUTION device manufactured by Nintendo Co., Ltd.,



of Kyoto, Japan, or an XBOX or XBOX 360 device manufactured by the Microsoft Corporation of Redmond, Wash.

Referring now to FIG. 2A, a block diagram of one example of a workflow is shown. In brief overview, the example workflow comprises a plurality of steps **200a**, **200b**, **200c**, **200d** (generally **200**). The steps may comprise one or more components **220**, which may comprise input components, text, images, animations, advertisements, and any other input/output means.

Still referring to FIG. 2A, now in greater detail, a workflow may comprise any series of components which allow a user to manage or complete a given task or situation. One example of a workflow might be a series of components which allow a property manager to handle the functions associated with a recent vacancy, such as scheduling a cleaning, returning deposits, and advertising for a new tenant. Another example of a workflow might be a series of components which allow an event planner to perform tasks associated with managing a new event, such as ordering food and drinks, scheduling staff, reserving space, and printing invitations.

A workflow may comprise any input/output components. In one embodiment, a workflow may comprise a series of HTML pages. In other embodiments, a workflow may comprise a series of pages in any markup language. A workflow may include any input means including text fields, buttons, radio buttons, checkboxes, menus, pull-down menus, and sliders. A workflow may include any means for creating dynamic user interactions, including without limitation scripts, Flash, Java applets, and Ajax.

In some embodiments, a workflow may be specifically adapted for a given industry or market niche. For example, a workflow may be adapted specifically to property management functions. Or, for example, a workflow may be specifically adapted to veterinary services management. Other examples of industries and services which workflows may be adapted for include, without limitation property management, health care studios, beauty salons, yoga studios, martial arts studios, contracting, roofing, plumbing, law, accounting, restaurants, hotels and motels, bed and breakfasts, storage, limousines, gardeners, tree services, veterinary services, chiropractics, dentists, water delivery, carpet cleaners, window cleaners, house cleaners, wedding planners, photographers, temp services, auto repair, auto parts, shipping, inventory/warehousing, construction and travel agencies. In other embodiments, a workflow may be customized for a given role. For example, a workflow may be customized for an accounts receivable supervisor, regardless of industry. In still other embodiments, a workflow may be customized for a given role within a given industry. For example, a workflow may be customized for a human resources director of a law firm, or a human resources manager of a legal staffing agency.

Referring now to FIG. 2B, a block diagram of an example workflow report is shown. In brief overview, a workflow report **250** may include any arrangement of data **260** corresponding to one or more workflows. In the example shown, the report contains a listing of properties within a given zip code that are managed by the user. A report **250** may include any data types, including without limitation text, graphics, photos, audio files, and video files.

Still referring to FIG. 2B, now in greater detail, a workflow report **250** may be generated by a workflow server **100**. A workflow report **250** may be based on any data corresponding to a workflow, including both data input through the workflow and data received from other sources. These other sources may include, without limitation, data from other databases, data from the internet, and data migrated from previous workflow software. A workflow report **250** may be presented to a

user via a web interface. For example, a web page may be provided on which a user may specify a number of search parameters for properties managed by the user. A web page may then be displayed containing the workflow report **250** of the properties matching the specified search parameters.

In some embodiments, users may be able to design custom reports, including without limitation specifying the formatting and data to appear in a report. For example, a property manager might specify that they would like a report of all properties with rent at least 5 days late, and to display the address, phone number, and total rent paid to date from the tenant.

Referring now to FIG. 3, a block diagram of an example workflow step with targeted advertising is shown. In brief overview, a workflow step **200** comprises an indication of the workflow step **201**, and a number of components **220a**, **220b**, **220c**, **220d**. The step also comprises a number of advertisements **310**, **312**, **314**, **316**, which may be integrated with the workflow components to varying degrees.

Still referring to FIG. 3, now in greater detail, an example workflow step comprises an indicator **201** informing the user of the workflow, and the current step in the workflow being displayed. In the example shown, the workflow step **200** is the second step in a workflow created for property managers to manage new vacancies. An indicator **201** may notify the user of the industry, role, or occupation corresponding to the workflow. In some embodiments, an indicator **201** may comprise a notification informing the user of how many times a particular workflow has been completed. In some embodiments, an indicator **201** may not be displayed.

The example workflow step **200** comprises a number of components **220a**, **220b**, **220c**, **220d** (generally **220**). A component **220** may comprise any input and output grouping that enables a user to complete or specify information corresponding to a discrete task or item. In addition to the examples shown, example components may comprise an order component, a purchase component, an address entry component, a login component, a calendar entry, a chart, a ledger entry, and a general input or question component.

The example workflow step **200** comprises a number of advertisements. An advertisement in a workflow may comprise any form of advertising used in conjunction with web pages or other computer displays. Advertisements in workflows may comprise text, links, images, graphics, sounds, animations, movies. Advertisements in workflows may also comprise interactive components. For example an advertisement for a cleaning service might prompt a user to enter an address to locate a franchise of the cleaning service near a given property. Or for example, an advertisement may be a click-to-call advertisement, wherein clicking the ad places a phone call to the advertiser via the computer displaying the workflow. In other embodiments, an advertisement may comprise any other means for contacting the advertiser, including electronic mail, fax, SMS, instant messaging, and chat functionality.

In one embodiment, advertisements may be displayed as banner advertisements **310**. Banner advertisements **310** may be displayed at the top or bottom, along a side, or in the middle of a workflow step. In some embodiments, banner advertisements **310** may be selected for display based on a correlation between the advertisement and the content of a workflow, a workflow step, or a component within a workflow step.

An advertisement **312** may be displayed in proximity to or otherwise associated with a workflow component. For example, the advertisement may be displayed as a textbox near the component. Or, for example, the advertisement may be a pop-up window displayed near the component. In some



embodiments, a component-associated advertisement **312** may be selected for display based on a correlation between the advertisement and the content of a workflow, a workflow step, or a component within a workflow step. In one embodiment, an advertisement may take the form of a tip or guide with respect to the workflow step or component.

An advertisement **314** may also be integrated with a component itself. In the embodiment shown, an advertisement for a cleaning service **314** is displayed as an option within a component **220c** relating to property cleaning. Advertisements may be integrated with components in any way, including, without limitation, as menu options, subquestions, images, popup text, rollover text, related links, and tips.

An advertisement **316** may also be displayed as a self-contained component. An advertisement may be displayed in a substantially similar manner to other non-advertising components, in such a way that the advertisement has the appearance of being an additional workflow item. For example, in the embodiment shown, the “advertise the vacancy online?” component **316** may comprise an advertisement for a given online listing service, which may pay a fee to the publisher of the workflow software to have the “advertise online” question included in the workflow, along with a link to the online listing service.

In some embodiments, advertisements displayed within a workflow may add value to the workflow user experience. Targeted advertisements may provide users with access to products, services, and information otherwise unavailable in workflow software. In some embodiments, an advertisement may be chosen to be displayed in a substantially similar manner to other non-advertising components as a result of the advertisement offering additional value to the workflow user. For example, if a workflow server determines that a significant number of users of an event planning workflow respond to an advertisement for an event security provider, the event security provider’s advertisement may be displayed similarly to other components in the event planning workflow to reflect the frequent use and value added.

Referring now to FIG. 4, a flow diagram of a method for displaying targeted advertisements to users of workflow software is shown. In brief overview, the method comprises: receiving, from an identified user, a request to display a step in a workflow, the workflow corresponding to a given industry (step **401**); determining, based on (i) the identified user, (ii) the step in the workflow, and (iii) the corresponding industry, an advertisement to be displayed in conjunction with the step in the workflow (step **403**); and transmitting, to the identified user, the requested workflow step and the determined advertisement (step **405**). In the description below, the method will be described in the context of being performed by a workflow server. In other embodiments, the method may be performed by any software and computing device, including workflow software executing on a client.

Still referring to FIG. 4, now in greater detail, a method for displaying targeted advertisements comprises receiving, from an identified user, a request to display a step in a workflow, the workflow corresponding to a given industry (step **401**). In some embodiments, the user may be identified via a logon. In other embodiments, a user may be identified by an internet address the user is connecting from. In still other embodiments, the user may be identified by information provided in a previous workflow step.

In some embodiments, the request to display a step in a workflow may comprise an HTTP request from a client. In one embodiment, a client may request to display a step in a workflow by requesting the first step of a workflow in a workflow selection screen. In another embodiment, a client

may request to display a step in a workflow by selecting a “next” or “continue” component on a workflow step, which then transmits a request to display the next step in the current workflow.

In some embodiments, a workflow server may determine, based in information in a client request, which step of a workflow to display. For example, in a property management workflow, the workflow server may determine whether to display a property tax payment step based on the location the user has entered for the property and the current time of the year. Or, for example, if a user has indicated on a previous step that a security deposit was not required for a given property, the workflow server may determine not to display a workflow step corresponding to returning a security deposit, and move to a third step in the workflow.

After receiving, from an identified user, a request to display a step in a workflow, the workflow corresponding to a given industry (step **401**), a workflow server **100** may then determine, based on (i) the identified user, (ii) the step in the workflow, and (iii) the corresponding industry, an advertisement to be displayed in conjunction with the step in the workflow (step **403**). In some embodiments, a workflow server may access data contained in an advertisement and user database in making the determination.

In some embodiments, a workflow server may maintain an advertising history with respect to a given workflow, a given industry corresponding to the workflow, and any users of the given workflow. A workflow server may use the advertising history to successively target an advertisement to an area generating the highest response for the advertisement. This successive targeting may be done with respect to an industry, the workflow, a step in a workflow, a component in a workflow, a user, or an occupational role of a user. For example, an advertisement for a paper goods outlet may be displayed in a number of workflows. In some embodiments, a random factor may be used to determine the initial workflows and workflow steps in which the advertisement will be displayed. The workflow server may then determine that the advertisement generates the most responses when displayed in conjunction with an event planning workflow. The workflow server may then further determine that the advertisement generates the most responses when displayed within a given step in the event planning workflow. The workflow server may then track the users who respond to the paper goods advertisement and determine to continue showing the advertisement to those users, or show other paper goods related advertisements to those users. The workflow server may employ any statistical correlation techniques in analyzing an advertising history and subsequently determining an advertisement to display.

In one embodiment, a workflow server may count and analyze user clicks for purposes of advertisement targeting. In another embodiment, a workflow server may count and analyze time that a user has spent accessing or viewing a given advertisement. In still other embodiments, a workflow server may count and analyze the number of completed sales an advertisement has generated.

In one embodiment, determining an advertisement to be displayed in conjunction with the step in the workflow (step **403**) may comprise determining, based on at least one prior input from the identified user, an advertisement to be displayed in conjunction with the step in the workflow. For example, a user may have previously ordered cleaning services through a given workflow, and thus an advertisement for a given cleaning service may be displayed to the user during a subsequent time the user is accessing the workflow. Or, for example, a user may have previously clicked on an advertisement for landscaping services, and thus other advertisements



## 11

for landscaping services may be displayed during a subsequent workflow session. Or, for example, a user may not have clicked on a previously displayed advertisement for a plumbing supply outlet, and thus the workflow server may determine to not show advertisements for plumbing supplies in subsequent workflow sessions.

In another embodiment, determining an advertisement to be displayed in conjunction with the step in the workflow (step **403**) may comprise determining, based on at least one prior input from a second user who previously requested to display the workflow, an advertisement to be displayed in conjunction with the step in the workflow. A workflow server may determine based on one or more previous users' response to an advertisement that the advertisement has a given probability of a successful response when displayed with the workflow. In some embodiments, a workflow server may identify users who share a given occupational role, geographic location, or any other properties or preferences. The workflow server may then display advertisements which received a successful response from one user to users who share one or more of that user's characteristics.

In some embodiments, a workflow server may determine, based on a geographic location identified with the user, an advertisement to be displayed in conjunction with the step in the workflow. The workflow server may identify the geographic location of the user by any means, including registration information, previous inputs into workflows, and IP addresses. In some embodiments, a workflow server may determine an advertisement to display based on a geographic location of a user input. For example, in an event planning workflow, if a user inputs an event location as Toledo, Ohio, the workflow server may then determine to display ads for services and stores in the Toledo area, even if the user is located elsewhere.

After determining an advertisement to be displayed in conjunction with the step in the workflow (step **403**), the workflow server may transmit, to the identified user, the requested workflow step and the determined advertisement (step **405**). The workflow step may be transmitted using any protocol and via any network. In one embodiment, the workflow step may be transmitted via an HTTP connection to a client operated by the user.

In some embodiments, the workflow server may determine a location for the advertisement within the workflow step based on at least one of the following: previous input from the user, previous input from a second user identified with the given industry, a random factor, or a predetermined ranking of advertisers. For example, the workflow server may determine that the advertisement corresponds to a specific component of the workflow step, and then include the advertisement in a location near the component. Or, for example, the workflow server may determine that a given advertisement has a high success rate, and then display the advertisement in a prominent position. Or, for example, the workflow server may prioritize advertisements based on fees received from advertisers, and then display higher priority advertisements in more prominent locations.

In addition to the techniques for targeting advertisements described above, other techniques may also be used to better target advertisements to users of workflow software. One technique may be to leverage the knowledge of users of the workflow software by having the users recommend advertisers. The users may recommend advertisers that the users have had prior dealings with, or are otherwise affiliated with and know to be interested in the industry serviced by a workflow. This technique may be referred to as community recommended advertising, in that it leverages recommendations

## 12

from a user community to better deliver targeted, relevant advertisements to that user community.

Referring now to FIG. **5**, an example workflow step enabling community recommended advertising is shown. In brief overview, a workflow step **200** comprises a banner indicating a promotion relating to advertiser recommendations **510**. The workflow step also comprises a number of means for users of the workflow to recommend potential advertisers **520**, **530**.

Still referring to FIG. **5**, now in greater detail, a banner **510** may be displayed to users of a workflow indicating a promotion relating to advertiser recommendation. In some embodiments, a promotion relating to advertiser recommendations may be displayed to users at logon, or by any other communication means, such as electronic mail. A promotion relating to advertiser recommendations may comprise any means for generating advertiser recommendations from users. In the example shown, a user recommending a certain number of advertisers may receive a free upgrade to their workflow software. In other embodiments, incentives for advertiser recommendations may include coupons, free offers, or additional workflow software components or functionality. In one embodiment, a user who recommends an advertiser who then advertises on a workflow may be awarded a certain percentage of the advertising revenue from the advertiser.

A workflow may use any means to solicit and provide input for user recommended advertisers. In some embodiments, inputs for user recommended advertisers may be integrated within a workflow step. For example, if a component of a workflow step prompts a user to enter contact information for a business or person relating to the workflow, the workflow step may also comprise a checkbox or other input means for allowing a user to specify that the identified contact may be interested in advertising on the workflow **520**. In other embodiments, a workflow step may solicit advertiser recommendations from a user's preexisting contact list **530**.

Referring now to FIG. **6**, a flow diagram of a method for allowing targeted advertisements to be recommended by users of workflow software is shown. In brief overview, the method comprises: displaying, to a user of a workflow, a screen corresponding to a step in the workflow, the screen providing an input for the user to recommend a potential advertiser corresponding to the workflow (step **601**); receiving, from the user, input corresponding to at least one recommended advertiser for the workflow (step **603**); and transmitting, to a server, information corresponding to the step in the workflow and the recommended advertiser (step **605**).

Still referring to FIG. **6**, now in greater detail, a method for allowing targeted advertisements to be recommended by users of workflow software comprises: displaying, to a user of a workflow, a screen corresponding to a step in the workflow, the screen providing an input for the user to recommend a potential advertiser corresponding to the workflow (step **601**). The workflow step may comprise any workflow step, and may be displayed in any manner.

The input for the user to recommend a potential advertiser corresponding to the workflow may comprise any input described herein. In some embodiments, the input may also collect information relating to a specific workflow step or component that the advertiser may be interested in advertising near. In one embodiment, the input may not inform the user that input results are being used to determine potential advertisers. For example, an input for a user to enter an address to order cleaning supplies may also store that address as a potential advertising contact. In another embodiment, the input may comprise a menu of preselected potential advertisers. In another embodiment, the input may comprise a list of



potential vendors, and the user may be asked to rank the products or services of the vendors. In still another embodiment, the input may comprise a prompt asking a user to state whether the user has dealt with a given business previously, and whether the user was satisfied with the business. In still another embodiment, the input may comprise a prompt asking the user to name the best vendor for a given product or service in a given area.

After displaying, to a user of a workflow, a screen corresponding to a step in the workflow, the screen providing an input for the user to recommend a potential advertiser corresponding to the workflow (step 601); a client may receive, from the user, input corresponding to at least one recommended advertiser for the workflow (step 603). The input may be received via any input device. In some embodiments, the input may be stored locally while a user completes a workflow step.

After receiving, from the user, input corresponding to at least one recommended advertiser for the workflow (step 603); a client may transmit, to a server, information corresponding to the step in the workflow and the recommended advertiser (step 605). This information may be transmitted via any network and using any protocol described herein.

In some embodiments, steps 603 and 605 may be performed simultaneously or otherwise overlap. In one embodiment, a user may be prompted to enter a recommended advertiser into a text field, which is in communication with the workflow server. As the user types, the text field may send the input to the workflow server, which then may analyze the partially typed message in order to provide a service, such as auto-completion. For example, the user may type "ab" into a workflow component. The workflow component may transmit the partially typed message to the server, which then may search the user's contact list and identify an entry for "ABC Motors", and then auto-complete the component with the information for ABC motors. The user may then submit the auto-completed form, at which time the information may be transmitted back to the server. A workflow component may use any dynamic input technology, including without limitation Flash, Ajax, Javascript, and Java Applets to provide dynamic features such as these.

Referring now to FIG. 7, a flow diagram of a second method for allowing targeted advertisements to be recommended by users of workflow software is shown. In brief overview, the method comprises: receiving, at a server from a user completing a workflow, information corresponding to a step in the workflow and an advertiser, the advertiser recommended by the user in connection with the step in the workflow (step 701); identifying, by the server, an advertisement corresponding to the recommended advertiser (step 703); and transmitting, from the server to a second client, a markup language page corresponding to the step in the workflow, the markup language page including the identified advertisement (step 705).

Still referring to FIG. 7, now in greater detail, a second method for allowing targeted advertisements to be recommended by users of workflow software comprises receiving, at a server from a user completing a workflow, information corresponding to a step in the workflow and an advertiser, the advertiser recommended by the user in connection with the step in the workflow (step 701). This information may be received via any network and using any protocol described herein.

In some embodiments, the information may also comprise information relating to a specific workflow step or component that the advertiser may be interested in advertising near.

The server may then identify an advertisement corresponding to the recommended advertiser (step 703). In one embodiment, the server may identify an advertisement from a database of stored advertisements. For example, a workflow step may be displayed to a user along with a menu of potential advertisers for whom the workflow server has ads that may be relevant to the workflow step. The server may then receive the input from the user identifying one or more of the advertisers as relevant to the workflow step. The server may then access a database of advertisements to identify an advertisement corresponding to the identified advertiser.

In one embodiment, the server may also use previous data collected on a particular advertisement to select an ad. For example, an advertiser may have submitted four advertisements for display in conjunction with workflows. The workflow server may determine that one of the ads has a higher rate of responses than the others. If the workflow server then receives a user recommendation to display ads for that advertiser on a given workflow, the workflow server may then select the advertisement that has previously had a high response rate. In another embodiment, the workflow server may select an advertisement that has previously received a high rating from users in a survey or other feedback mechanism.

In some embodiments, the server may contact the advertiser with a request to submit an advertisement. For example, upon receiving a user recommendation that XYZ Corp. should advertise on a property management workflow, a workflow server may send an e-mail to XYZ Corp. informing them of the recommendation, and requesting them to submit advertising materials. In one embodiment, this request may comprise a link to a web site which allows a company to electronically submit advertisements, which are then included in the workflow server's advertisement database. In other embodiments, this request may comprise an instruction to e-mail, call, or otherwise contact personnel responsible for managing the advertising content for the workflows. In still other embodiments, the request may comprise an option for the advertiser to have an advertisement automatically generated by the workflow server. For example, the workflow server may generate an advertisement comprising the name of the advertiser and a text link to the advertiser's web site.

In another embodiment, the workflow software may comprise messages or functionality to enable users to contact and sign up or help sign up potential advertisers. In one embodiment, users may be encouraged to contact potential advertisers and be provided with a telephone number for them or the potential advertisers to call with advertiser leads. In another embodiment, the users may be encouraged to use a previously known telephone number, e-mail address, or URL for purposes of signing-up potential advertisers. In another embodiment, users may be provided with a link or e-mail address to give to potential advertisers, which will then connect the potential advertisers to a sign up procedure for displaying advertisements within the workflow software. In some embodiments, this link may comprise information about the user recommending an advertiser. For example, a user may be provided with a link incorporating a user identifier corresponding to the user. If a potential advertiser then uses the link to sign up for displaying advertisements, the workflow server may recognize the user identifier, and distribute a reward, bonus, or other incentive to the user accordingly. The workflow server may also then mark any advertisements submitted by the advertiser using the link as recommended by the user, and use this information in determining future workflows in which to display the advertisements.

After identifying, by the server, an advertisement corresponding to the recommended advertiser (step 703); the



server may then transmit, to a second client, a markup language page corresponding to the step in the workflow, the markup language page including the identified advertisement (step 705). The advertisement may be displayed within the page according to any of the embodiments described herein. In some embodiments, information relating to identifying the advertisement (step 703) may be displayed along with the advertisement. For example, an advertisement may be displayed along with text stating “98% of workflow software users who used this advertiser were happy with the results,” or “This advertiser was given the highest quality rating in a survey of users of this workflow,” or “This advertiser was identified by someone in your geographic area as a high-quality business.”

Now referring to FIG. 8, a method for automatically spell-checking dynamically generated web pages is shown. In brief overview, the method includes: generating, by a server responsive to a request from a client, a dynamically generated web page containing at least some text (step 801); transmitting, by the server to the client, the dynamic web page (step 803); intercepting, by a process, the dynamic web page (step 805); identifying, by the process, the at least some text (step 807); executing, by the process, a spelling check on the at least some text (step 809); and outputting, by the process, at least one word identified by the spelling check as potentially misspelled (step 811). Although the method is described as being performed with a single process, it should be understood that the method may be performed with any number of processes working simultaneously and/or sequentially.

Still referring to FIG. 8, now in greater detail, a server may generate a dynamically generated web page in response to a client request in any manner (step 801). In some embodiments, the server may be a workflow server 100. In other embodiments, the server may comprise any other server or group of servers. The server may generate the page using any techniques for dynamic generation of web pages, including without limitation Perl, CGI, and PHP. In some embodiments, the web page may comprise one or more steps in a workflow. In other embodiments, the web page may comprise a workflow report. In still other embodiments, the web page may comprise any other type or form of web page. The web page may include any type of content, including without limitation plaintext, HTML, DHTML, Javascript, XML, Flash, and/or SVG.

The server may then transmit the web page to the client in any manner and via any protocol or protocols (step 803). In some embodiments, the server may transmit the entire web page as part of a single uninterrupted transmission. In other embodiments, the server may transmit the web page in stages. In still other embodiments, the web page may contain dynamic content which is updated periodically or in response to user input. For example, the web page may contain a list which is updated with new data from the server in response to user interactions with the list, while the rest of the page remains static.

A process may then intercept the web page in any manner (step 805). In some embodiments, the process may execute on the same physical machine as the server. For example, the process may install a listener in the network stack of the server, and intercept any outgoing web pages. In other embodiments, the process may execute on a different machine from the server. In some embodiments, the process may execute on a network appliance that serves as a gateway to the server. In other embodiments, the process may execute on a different server. In these embodiments, the process may use a packet sniffer, a network switch, router configurations, load balancer, or any other means to intercept the web page. In

some embodiments, the server may automatically forward any web pages generated to the process.

The process may then identify the at least some text in any manner (step 807). In some embodiments, the process may parse the web page to identify any text that is not part of a script or formatting instructions. For example, the process may parse the web page to identify textual elements of the web page as opposed to images and graphics. This parsing may include ignoring such things as tag names, variables and parameters within tags, and script commands. In some embodiments, any scripts contained in the web page may be parsed for textual elements, such as strings which may eventually be displayed on the web page. In some embodiments, the process may identify only text that will be displayed to a viewer when the page is rendered.

The process may then execute a spelling check on the at least some text (step 809). The spelling check may be performed in any manner and use any dictionary of acceptable words. In some embodiments, the spelling check may use a dictionary of words of one more languages depending upon the languages specified in the page. In some embodiments, the spelling check may use a dictionary of acceptable words that has been modified by a user to reflect specific user preferences of acceptable words. For example, an administrator may upload a list of company names and local street names that a user does not wish to be flagged by the spell check. In these embodiments, the spell check may determine to which workflow and/or client firm a web page corresponds, and use a dictionary customized to that workflow and or client.

The process may then output in any manner at least one word identified by the spelling check as potentially misspelled (step 811). In some embodiments, the process may save the misspellings to a log file. Such a log file may contain the potentially misspelled words along with any details about the web page containing the potentially misspelled word, including without limitation the page’s URL, time of transmission, and some or all of the page’s content. This log file may then be sent to and reviewed by an administrator of the workflow server 100 or an administrator of a client of workflow server. In other embodiments, the process may alert an administrator to a potential misspelling by any other means, including without limitation an e-mail, a web page, or an instant message. In some embodiments, the process may alert an administrator to potential spelling errors as they occur. In other embodiments, the process may generate a report of potential misspellings periodically.

In some embodiments, a single process may perform automated spell-checking for a plurality of workflows and/or a plurality of client firms. In these embodiments, the process may keep separate logs and/or separately alert administrators of the workflows and/or firms of the potential spelling errors.

In some embodiments, after an administrator receives a report of a potentially misspelled word, the administrator may transmit an indication to the process that the word is correct. In these embodiments, the process may then update a dictionary such that the word is not reported as potentially misspelled in the future. In some embodiments, an administrator may be able to specify whether the word should be accepted only in a particular context, or globally across one or more workflows. For example, the process may report that a word is misspelled, but an administrator may know the word represents a street name that is spelled correctly the administrator may then indicate to the process to ignore that word in future spelling checks of that page, or of any pages for a particular client, or of any pages in a particular geographic area.

In some embodiments, the process may also perform any other verification of the web page, including without limita-



tion checking for proper formatting and checking for standard usage of HTML, XML or any other language. As with the spell check, any of these checks may be performed either against a global set of rules, or sets of rules specific to a client and/or workflow. In some embodiments, the process may also check grammar for a web page. In these embodiments, notifications of potential grammar mistakes may be handled in a similar manner to spelling errors.

In some embodiments, the processor may comprise a web browser or a simulated web browser which renders the web pages prior to verification of spelling or other characteristics. These embodiments may be used to ensure that any corrections will be suggested to how the page appears as it would be seen by a user.

In some embodiments, an automated spell check may be used in conjunction with a development server to spell check a number of dynamically generated pages prior to a web site being deployed. In these embodiments and others, a script or process may be run to automatically generate a number of queries for web pages.

Although the spell checking systems and techniques have been described above in the context of spell-checking web pages, in some embodiments, spell checking may be used for web applications. For example, web applications may be developed which execute on a client independently of a web browser. Examples of technologies which may be used to develop web applications include without limitation, SILVERLIGHT, published by Microsoft Corp., and AIR and FLASH, each published by Adobe, Inc. In these embodiments, data may be sent from a server to the executing web application, and a process may intercept the data and perform any spell-checking techniques. In some embodiments, the process may render or otherwise process the data prior to spell-checking to ensure the data is spell-checked in the form it will be displayed by the web application to the user.

While the invention has been particularly shown and described with reference to specific preferred embodiments, it should be understood by those skilled in the art that various changes in form and detail may be made therein without departing from the spirit and scope of the invention as defined by the appended claims.

We claim:

1. A method for automatically spell-checking dynamically generated web pages, the method comprising:

- a. receiving, by a server computing device, a request from a client computing device for a web page associated with a workflow;
- b. generating dynamically, by the server computing device responsive to the received request, a web page containing at least some text;
- c. intercepting after dynamic generation of the web page by the server computing device and before transmission to the client computing device, by a process executing on the server computing device, the dynamically-generated web page;
- d. identifying, by the process executing on the server computing device, the at least some text contained in the web page;

- e. executing, by the process executing on the server computing device, a spelling check on the identified at least some text; and
- f. outputting, by the process executing on the server computing device, at least one word identified by the spelling check as misspelled.

2. The method of claim 1, further comprising receiving, by the process executing on the server computing device, user input indicating that the at least one word was spelled properly.

3. The method of claim 2, further comprising transmitting, by the process executing on the server computing device, instructions to update a dictionary, of words used to identify misspelled words with the at least one word.

4. The method of claim 1, wherein the server computing device receives periodic requests for the dynamically generated web page.

5. The method of claim 1 further comprising storing to a log file, by the process executing on the server computing device, at least one word identified by the spelling check as misspelled.

6. The method of claim 5 further comprising transmitting the stored log file to an administrator of the server computing device.

7. The method of claim 1 further comprising validating the use of HTML by the generated web page.

8. The method of claim 1 further comprising executing, by the process executing on the server computing device a grammar check on the at least some text.

9. A computer-implemented system for automatically spell-checking dynamically generated web pages generated in response to a request from a client computing device for a web page associated with a workflow, the server computing device comprising:

- means for receiving a request from a client computing device for a web page associated with a workflow;
- means for dynamically generating, responsive to the received request, a web page containing at least some text;
- means for intercepting the web page after dynamic generation and before transmission to a client computing device;
- means for identifying the at least some text in the intercepted web page;
- means for executing a spelling check on the at least some text; and
- means for outputting at least one word identified by the spelling check as misspelled.

10. The system of claim 9, wherein the server computing device further comprises means for receiving user input indicating that the at least one word was misspelled.

11. The system of claim 9 wherein the means for intercepting the web page comprises a listener in a network stack of the server computing device.

12. The system of claim 9 further comprising a dictionary of words used by the means for executing a spelling check.

13. The system of claim 9 further comprising a web browser sending the web page prior to verification of spelling.